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ABSTRACT

This study examined three questions about measures of accomplishments--notable attainments that have been publicly recognized: their pseudoipsativity, the correspondence between quantity and quality scores, and their dimensionality. Comparable samples of graduate students described their accomplishments on a questionnaire or judged the similarity of the same accomplishments. Sample 1 consisted of 204 first-year graduate students, and sample 2 consisted of 75 students from four colleges. The Accomplishments Questionnaire consisted of 52 items in 6 areas. Accomplishments in the same field were positively correlated, while accomplishments in different fields varied in their correlations, some being positive and others being negative; these results are inconsistent with the predominantly negative correlations that would occur with ipsative measures. Measures of the quantity and quality (importance, rarity) of accomplishments correlated highly, after correction for attenuation, and appeared to assess the same thing. Analyses of self-report data found that accomplishments were factorially complex, with many of the same factors identified in other kinds of measures appearing. The factors observed in the judgment data largely corresponded to the semantic features of the accomplishment items (Contains 4 tables and 25 references.) (Author/SLD)

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MEASURING ACCOMPLISHMENTS: PSEUDOIPSATIVITY, QUANTITY VS. QUALITY, AND DIMENSIONALITY

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Princeton, New Jersey
April 1996

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March 1996

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Abstract

This study examined three questions about measures of accomplishments--notable attainments that have been publicly recognized: their pseudoipsativity, the correspondence between quantity and quality scores, and their dimensionality. Comparable samples of graduate students described their accomplishments on a questionnaire or judged the similarity of the same accomplishments. Accomplishments in the same field were positively correlated, while accomplishments in different fields varied in their correlations, some being positive and others being negative; these results are inconsistent with the predominantly negative correlations that would occur with ipsative measures. Measures of the quantity and quality (importance, rarity) of accomplishments correlated highly, after correction for attenuation, and appeared to assess the same thing. And analyses of the self-report data found that accomplishments were factorially complex, with many of the same factors identified in other kinds of measures appearing; the factors observed in the judgment data largely corresponded to the semantic features of the accomplishment items.

Measuring Accomplishments: Pseudoipsativity, Quantity vs. Quality, and Dimensionality

It is universally recognized that what a person has accomplished in life provides important information about him or her. On the one hand, the accomplishments are an indication of the person's abilities, motives and interests, and personality traits. On the other hand, the accomplishments forecast what he or she can achieve in the future.

The importance of accomplishments for the systematic study of individual difference is underscored by criticisms of traditional measures and by calls for the assessment of real-life behavior. Ability tests, interest and personality inventories, projective techniques, and other methods, by and large, are measures of "signs" rather than "samples" of behavior (Goodenough, 1949). Although these methods have value, they also have limitations, leading a number of critics to argue for the importance of studying behavior directly, not its signs (e.g., Frederiksen, 1984; McClelland, 1973; Wernimont & Campbell, 1968).

Beginning with the ground breaking research by Holland (1961), accomplishments--commonly defined as notable attainments that have been publicly recognized--have been widely studied in high school, college, and graduate school populations, primarily as a means of assessing talent. This research has established that (a) accomplishments at early stages of the school career (e.g., high school) predict accomplishments at later stages (e.g., college); (b) early accomplishments are better predictors of later accomplishments than are tests of academic ability, school grades, interest inventories, or personality measures (personality scales and self-ratings); and (c) tests of academic ability are uncorrelated with accomplishments, but interest inventories and personality measures are modestly correlated with them (see the reviews by American College Testing Program, 1973; Baird, 1976).

This body of work clearly suggests that the assessment of accomplishments has promise. Nonetheless, some important measurement issues remain to be resolved. One

concerns the unusual psychometric properties of accomplishments measures. Accomplishment measures may be "pseudoipsative" in nature (Werts, 1967). The measurement process does not explicitly involve intra-individual comparisons that produce literal ipsativity (Cattell, 1944; Hicks, 1970; Radcliffe, 1963), but an analogous pseudoipsativity may occur because of the finite nature of people's time and energy. A person who devotes himself or herself to one activity (e.g., writing novels) may simply not have the resources to do another activity (e.g., writing poems, doing scientific experiments). The upshot is that associations of accomplishment measures with each other, even those within the same area, as well as with other variables may be affected, paralleling what happens with explicit ipsative measures (e.g., predominantly negative intercorrelations among ipsative measures and near-zero average correlations with normative variables; Hicks, 1970; Radcliffe, 1963). Such pseudoipsativity could complicate studies of the reliability, dimensionality, and validity of accomplishment measures, as well as the procedures used to develop such devices.

Another issue is the distinction between the quantity and quality of accomplishments. Although all accomplishments are uncommon and important, some are of higher quality than others. Whether the sheer quantity of accomplishments or their quality should be assessed is uncertain. Several studies have examined this issue. Most pertinent is an investigation by Skager, Schultz, and Klein (1965), who reported that a quantity measure, the number of all kinds of accomplishments, common or rare, correlated moderately with a quality measure (the quality of the most outstanding accomplishment) and had different patterns of correlations with ability tests and background variables. Two other studies are also relevant. Holland and Nichols (1964) found that measures of rare and common accomplishments correlated

moderately. And Nichols and Holland (1963) observed that a measure of rare accomplishments correlated substantially with a measure of all kinds of accomplishments (rare or common) and the two measures had different patterns of correlations with ability tests, personality measures, and background variables. The differential functioning of quantity and quality measures of accomplishments, and of rare and common accomplishments measures in these studies may be attributable to their unreliability. This possibility is in line with the Nichols and Holland (1963) conclusion, though Skager et al. (1965) argue otherwise.

A third issue is the dimensionality of the accomplishments domain. Although a variety of accomplishments have been examined, no systematic effort has been made to map the domain. Research with interest inventories and biographical questionnaires suggests that the accomplishments domain may be equally complex (e.g., see the reviews by Dawes, 1991; Mumford & Owens, 1987). The unusual psychometric properties of accomplishments measures could complicate conventional methods of studying dimensionality, such as factor analyses of self-reports of accomplishments. An alternative approach to examining their dimensionality would be multivariate analyses of judgments of the similarity of accomplishments.

Accordingly, the aims of this study were threefold: (a) to examine the pseudoipsativity of accomplishments measures; (b) to investigate the correspondence between quantity and quality scores for the measures; and (c) to explore the dimensionality of the measures.

Method

Overview

Two comparable samples of graduate students were employed. One sample described their accomplishments on a questionnaire covering six broad areas of accomplishments; the other sample judged the similarity of these same accomplishments and rated their importance. The ipsativity of the accomplishments was assessed from their intercorrelations in the self-report data. The correspondence between quantity and quality scores was appraised from the correlations between quantity scores (the number of reported accomplishments) and two quality scores (the importance and rareness of reported accomplishments) in the self-report data. And the dimensionality of the accomplishments was evaluated by two alternative approaches, given the unusual psychometric properties of these variables: a factor analysis of a matrix of intercorrelations of the accomplishments in the self-report data and a parallel factor analysis of a matrix of similarity indexes in the similarity judgment data.

Sample

Two samples of graduate students (paid volunteers) were employed. Sample 1 consisted of 204 first-year students, native English speakers from schools near 12 ETS computer-based test centers. This sample was obtained in a previous study (Bennett & Rock, 1995). Sample 2 consisted of 75 students, U.S. citizens, from four institutions. The students in this sample were recruited to be comparable in sex, native language, and graduate field to those in Sample 1. Both samples were limited to students with usable data. The characteristics of the samples are summarized in Table 1. About a third of each sample was male (32%, 36%), all or virtually all were U.S. citizens (95%, 100%), and the most common graduate field was Social Science (43%, 49%).

Insert Table 1 about here

Variables

Accomplishments Questionnaire. The Accomplishments Questionnaire consisted of 52 items covering six areas: academic achievement (5), leadership (5), practical language (public speaking, journalism; 12), aesthetic expression (creative writing, art, music, dramatics; 20), science (5), and mechanical (5).[1] These 6 are among 13 potential areas of accomplishments identified in a review of factor analyses of biographical, interest, and leisure-time activities data (Stricker, 1983). (The other areas are clerical, business, professional orientation, social welfare [e.g., coaching], religious, athletic, and adventure [e.g., sky diving]). The items used a combined multiple-choice and open-ended format (e.g., "Have you been elected to a major class office in college? If so, what position?"). This item format is modeled after one used previously by Skager et al. (1965) and Baird (1979).

Item sorting. The multiple-choice portions of the 52 items on the Accomplishments Questionnaire were printed on 3" x 5" cards and arranged in random order. Subjects were given these written instructions for making judgements of their similarity, adapted from Stricker, Jacobs, and Kogan (1974):

> Your task is to judge the similarity of various activities and accomplishments. Each activity or accomplishment will be on a card. Please go through them and sort into groups the activities and accomplishments that seem similar. For example, "Organized a drive to lobby for the passage of legislation" and "Testified at a legislative hearing" might belong together in one group. And "Received an award

from a farm organization (e.g., Future Farmers of America)" and "Won a prize at a livestock show" might belong in another group. You may have as few or as many groups as you wish, and you may have as few or as many activities and accomplishments in a group as you wish. If an activity or accomplishment does not seem to belong in any of the groups, you may put it in the "miscellaneous" group.

When you finish, put a rubber band around the cards in each group. And if you have a miscellaneous group, write "miscellaneous" on each of the cards in that group.

Rating importance. The 52 multiple-choice portions of the items, arranged in the same order as in the sorting task, were administered in a questionnaire, with the following instructions:

Please rate the merit of the following activities or accomplishments, using the 10-point scale shown. [The ratings ranged from 1 (No Merit) to 10 (Greatest Merit).] Base the merit rating on the value and excellence of the activity or accomplishment.

Procedures

The Accomplishments Questionnaire was individually administered to the students in Sample 1 as part of a battery of other paper-and-pencil tests, as well as computer-administered tests. The sorting and rating tasks were individually administered, in counterbalanced order, to the students in Sample 2.

Analysis

Product-moment correlations were computed between the multiple-choice portions of the items on the Accomplishments Questionnaire (scored for endorsement, Yes = 1, No = 0).

Quantity and quality scores were obtained for the Accomplishment Questionnaire's aesthetic expression items, the area with the largest number of items (20). The quantity score

was the number of endorsed items. The two kinds of quality scores were (a) Very Important--the number of endorsed items with high mean importance ratings (above the median rating of 6.8) and Less Important--the number of endorsed items with low mean importance ratings (at or below the median of 6.8); and (b) Very Rare--the number of endorsed items with low endorsement proportions (at or below the median of .04) and Less Rare--the number of endorsed items with high endorsement proportions (above the median of .04). Product-moment correlations between the scores, as well as the scores' internal-consistency reliability (Coefficient Alpha), were computed.

The proportions of instances in which items were put in the same piles in the sorting task (Rosenberg & Jones, 1972) was tabulated. The square root of these proportions were calculated to obtain vector products (Nunnally, 1978).

Parallel factor analyses were conducted of the matrix of intercorrelations from the questionnaire data and the matrix of vector products from the sorting data. This "proportion square root analysis" of the sorting data is a form of multidimensional scaling (Nunnally, 1978). The principal components method was used in these analyses, alternative number of factors, suggested by the score test (Cattell, 1966), were rotated by the Varimax procedure (Kaiser, 1958), and the final decision about the number of factors was based on interpretability. Factors were matched by the coefficient of congruence (Harman, 1967) and visual inspection.

Results and Discussion

Item Intercorrelations

The proportions of positive item intercorrelations within and between the six areas are shown in Table 2. The intercorrelations within areas were highly positive, the proportion of

positive correlations ranging from .64 for Aesthetic Expression to 1.00 for Academic Achievement and Science. The intercorrelations between areas were mixed, the proportion of positive correlations ranging from .23 (Aesthetic Expression and Mechanical) to .72 (Leadership and Practical Language), with 8 of the 15 proportions being above .50.

In short, most of the accomplishments were rarely reported. Accomplishments in the same field were positively related, and accomplishments in different fields varied in their relationships, some being positively related and others negatively related; there results within and between areas are inconsistent with the predominantly negative relations that would occur with ipsative measures (Hicks, 1970; Radcliffe, 1963).

Insert Table 2 about here

Intercorrelations of Quantity and Quality Scores

The intercorrelations of the quantity and quality scores for the Aesthetic Expression area reported in Table 3. The internal-consistency reliability of these scores and the intercorrelations corrected for attenuation also appear in this table.

The two counterparts of each kind of quality score correlated moderately: .46 for Very Important and Less Important, and .34 for Very Rare and Less Rare. In contrast, corresponding quality scores correlated substantially: .71 for Very Important and Very Rare, and .90 for Less Important and Less Rare. And all of the quality scores correlated very highly with the quantity score, the correlations ranging from .90 (Less Rare) to .72 (Very Rare). All of these correlations are attenuated by the unreliability of the scores. Corrected for attenuation, all of the correlations were above .90, except for the .60 for Very Rare and

Less Rare. It should be noted that the correlations between the quantity and quality scores and between the counterparts of each kind of quality score are inflated by item overlap.

In brief, accomplishments differing in their quality were substantially related to each other and to the sheer quantity of accomplishments, when the unreliability of these measures was taken into account.

Insert Table 3 about here

Factor Analyses of Items

The rotated factor loadings for the questionnaire data and the sorting data appear in Table 4.[2]

Seven factors were identified in the questionnaire data. The factors accounted for 19.7% of the total variance, ranging from 3.4% for Factor I to 2.4% for Factor VII. The factors were Art and Music (I), Radio and Television (II), Practical Language (III), Mechanical (IV), Public Speaking/Dramatic Arts (V), Science (VI), and Academic Achievement (VII).

Four of the six original categorizations of the items based on previous factor analyses of biographical, interest, and leisure-time activities data (Stricker, 1983) were represented by factors in this analysis: Academic Achievement, Practical Language, Science, and Mechanical. A fifth categorization, aesthetic expression, was broken up into several factors: Art and Music, Public Speaking/Dramatic Arts, and Radio/Television. The only categorization not represented in any way was leadership.

Eight factors were identified in the sorting data. The factors accounted for 44.9% of the total variance, ranging from 11.3% for Factor I to 1.8% for Factor VIII. The factors were Public Performance (I), College Activities (II), Paid Activities (III), Writing (IV), Prize Winning (V), Speaking (VI), Science (VII), and Artwork (VIII).

Only one of the original categorizations of the items was represented by a factor: Science. Two other categorizations, academic achievement and leadership, were subsumed by a single factor, College Activities. Other categorizations were incompletely represented by factors: practical language by the Speaking factor, and aesthetic expression by the Artwork factor.

It is noteworthy that most of the factors in this analysis corresponded to the semantic features of the items. For Public Performance (I) items, phrases such as "public performance," "publicly performed," "publicly broadcast," and "publicly shown"; for College Activities (II) items, "college"; for Paid Activities (III) items, "for pay, for a company or other organization"; for Prize Winning (V) items, "a winner or runner-up of a prize or award"; for Science (VII) items, "scientific"; and for Artwork (VIII) items, "artwork." The Writing (IV) and Speaking (VI) factors were important exceptions. Most of the items on the Writing factor included "wrote," but this word also appeared in items on other factors. All of the items on the Speaking factor concerned speaking but differed in their semantic content, their key phrases being "a formal speech," "master or mistress of ceremony," and "spokesperson or press aide."

One factor in the two analyses matched: Science (VI in the questionnaire data, and VII in the sorting data).

In sum, a number of factors emerged in the analyses of the questionnaire and sorting data, and the factors generally differed in the two analyses, with most of those in the questionnaire data resembling factors previously identified in other kinds of measures and most of the factors in the sorting data corresponding to the semantic features of the items.

Insert Table 4 about here

Conclusions

Pseudoipsativity

No sign of pseudoipsativity in the accomplishments measures appeared, contrary to what was suggested previously (Werts, 1967). Substantively, the students in this study did not focus on one activity at the expense of competing activities. Whether this result is generalizable to other populations of examinees is uncertain. It is conceivable that other kinds of examinees may have a more single-minded devotion to a particular field, producing ipsativity in the accomplishments measures, but it should be recalled that the students in this study were graduate students, presumably more specialized in their interests than most examinees.

These outcomes suggest that the unusual properties of accomplishments items do not interfere with the use and interpretation of standard statistical and psychometric analytical methods in their construction and evaluation.

Quantity and Quality Scores

The limited findings on the quantity vs. quality issue suggest that the two kinds of scores measure the same thing. Especially persuasive was the extremely high correspondence

between measures of the most important and least important accomplishments, after taking the measures' unreliability into account. These results, supporting the Nichols and Holland (1963) contention that high and low level accomplishments function similarly, should not be overinterpreted. First, they were based on accomplishments in only one area, aesthetic expression. Whether the same results would occur in other areas is unknown. Second, the outcomes in analyses of this kind may depend on the quality of the pool of accomplishments examined: the greater the variability in the quality of accomplishments, the greater the opportunity for detecting differences among them. The accomplishments in the present analysis were generally at a high level.

Dimensionality

The factor analyses of the questionnaire data and the sorting data provide markedly different pictures of the dimensions underlying the accomplishments. Given the absence of pseudoipsativity, which would complicate analyses of the questionnaire data (Hicks, 1970; Radcliffe, 1963), and the correspondence between the factors in these data and in factor analyses of other kinds of measures, the results based on the questionnaire data appear to provide a better insight into what this device is actually measuring. It is evident that the accomplishments domain is factorially complex. It is also highly likely, in light of the general agreement between the factors identified in the questionnaire and in other kinds of measures, that additional accomplishments factors, resembling those found in other measures but not represented in the present questionnaire, exist and can be measured (clerical, business, professional orientation, social welfare, religious, athletic, and adventure; Stricker, 1983).

The nature of the factors in the sorting data is intriguing. Despite the general correspondence observed between the factors and the semantic features of the items, it is far

from certain that the students based their judgments solely on the semantic content of the items, without regard to their substantive meaning. All of the factors with semantic content also had congruent substantive content, the semantic and substantive correspondence concerning the setting (college, for pay) or the activity (public performance, writing, prize winning, science, art). The possibility that the similarity judgments were based on substantive meaning, not semantic content, is also supported by the emergence of the Speaking factor, which is devoid of consistent semantic content, and the Writing factor, which shares the same semantic content with other factors. It seems implausible that subjects would base some of their judgments on semantics and others on substance.

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Author Note

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Footnotes

[1]A copy of the questionnaire is available from the first author.

[2]The matrix of intercorrelations from the questionnaire data and the matrix of vector products from the sorting data are available from the first author.

Table 1

Percentage Distributions of Background Characteristics, Samples 1 and 2

Variable	Sample 1 (N=192)	Sample 2 (N=75)
Sex		
Male	32	36
Female	68	64
Graduate Major		
Humanities/Arts	18	12
Education	14	20
Social Sciences	43	49
Life Sciences	15	16
Physical Science	7	3
Engineering	1	0
Other	2	0
Age		
20-29		65
30-39		27
40-49		8

Table 1 (continued)

Variable	Sample 1 (N=192)	Sample 2 (N=75)
Citizenship		
U.S.	95	100
Other	5	0

Note. The data in column 2 are from Bennett and Rock (1995). The sample is smaller than the one used in the present study (192 vs. 204) because students with missing data on other variables were excluded by Bennett and Rock.

Table 2

Proportion of Positive Intercorrelations of Items in Six Areas.

Area	(1)		(2)		(3)		(4)		(5)		(6)	
	n	Proportion	n	Proportion	n	Proportion	n	Proportion	n	Proportion	n	Proportion
(1) Academic Achievement	10	1.00	25	.52	60	.67	100	.47	25	.64	25	.44
(2) Leadership			10	.80	60	.72	100	.48	25	.52	25	.52
(3) Practical Language					66	.73	240	.59	60	.47	60	.45
(4) Aesthetic Expression							190	.64	100	.41	100	.23
(5) Science									10	1.00	25	.64
(6) Mechanical											10	.80

Note. n is the total number of intercorrelations.

Table 3

Intercorrelations and Reliability of Quantity and Quality Scores for Aesthetic Expression Items

Score	(1)	(2)	(3)	(4)	(5)
(1) Standard (Quantity)	(.66)	.82	.89	.72	.90
(2) Very Important	1.00	(.49)	.46	.71	.66
(3) Less Important	1.00	.90	(.52)	.55	.86
(4) Very Rare	1.00	1.00	.93	(.66)	.34
(5) Less Rare	1.00	1.00	1.00	.60	(.53)

Note: Actual correlations appear above the diagonal; attentuation-corrected correlations appear below it. Diagonal values are internal-consistency reliability coefficients.

Table 4

Factor Analyses of Questionnaire and Sorting Data

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
1. Was in an independent study program for outstanding students in college.	.32						.35		.88						
2. Was on the Dean's list in college.							.61		.87						
3. Was elected to Phi Beta Kappa on an equivalent honor society in college.							.59		.87						
4. Graduated from college with honors.							.63		.88						
5. Was the valedictorian or salutatorian in college.									.88						
6. Served on a student-faculty committee in college.			.39						.92						
7. Was appointed or elected to a school-wide student group in college.				.44					.91						
8. Was elected to a major class office in college.				.61					.92						
9. Was appointed or elected an officer in a club, sorority, professional society, or other organized interest group.									.76						
10. Started a club, sorority, professional society, or other organized group.									.72						

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
11. Was a member of a school-wide debating team in college.			.57						.86						
12. Made a formal speech at a large public gathering, other than graduation ceremonies.			.36					.36					.80		
13. Was a winner or runner up of a prize or award for public speaking.			.49									.72	.62		
14. Was a master or mistress of ceremonies at a large banquet, awards ceremony, or show.					.50			.31					.80		
15. Appeared regularly on a radio or television program in a non-performing role.		.58						.64					.55		
16. Was a paid spokesperson or press aide for a company or other organization.			.53							.54			.66		
17. Wrote a "letter to the editor" that was published.			.35								.73		.32		
18. Wrote a feature article, column, or editorial that was published.			.62					.36			.78				

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
19. Was on the editorial staff of a publication or a radio or television station.		.54						.38			.55		.30		
20. Wrote a speech for someone else that was given at a large public gathering.								.32			.59		.50		
21. Wrote advertising or public relations material, for pay.			.31							.62	.55		.32		
22. Wrote technical manuals or other instructional material, for pay.				.40						.74	.50				
23. Wrote poetry, fiction, or essays that were published.		.33	.42					.55			.67				
24. Wrote a play that was publicly performed or a screenplay for a film that was publicly shown.					.46			.70			.55				
25. Wrote the script for a dramatic or comedy show for radio or television that was publicly broadcast.		.81						.71			.53				
26. Invited to participate in a writer's workshop.		.44						.33			.57	.42			

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
27. Was a winner or runner-up of a prize or award for creative writing.			.48								.47	.80			
28. Designed the scenery or costumes for a play or dance that was publicly performed or a film that was publicly shown.					.46			.83							
29. Created artwork that was exhibited.	.42						-.43	.63							.63
31. Did artwork, for pay.	.61							.47			.54				.56
32. Was a winner or runner-up of an award or prize for art.	.58		.48					.37				.83			.31
33. Sang as a soloist or member of a group at a public performance.					.67			.88							
34. Played a musical instrument as a soloist or member of a group at a public performance.								.88							
35. Conducted a band, orchestra, or vocal group at a public performance.	.80							.88							
36. Composed or arranged music that was publicly performed.	.68							.80							

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
37. Was a winner or runner-up of an award or prize for composing or performing music.	.77							.49				.73			
38. Acted in a play that was publicly performed or a film that was publicly shown.					.67			.89							
40. Directed a play that was publicly performed or a film that was publicly shown.					.63			.86							
41. Directed a dramatic or comedy show for radio or television that was publicly broadcast.		.83						.88							
42. Was a winner or runner-up of a prize or award for acting or directing.								.50				.80			
43. Was a research assistant on a scientific project in college.						.62			.73						.49
44. Authored or co-authored a paper that was presented at a scientific meeting.						.70			.33		.37			.75	
45. Authored or co-authored an article that was published in a scientific journal.						.67					.40			.81	

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
46. Received a grant for scientific research.						.53			.45					.74	
47. Was a winner or runner-up of an award or prize for science.				.39					.30			.66		.62	
48. Designed machinery or equipment, for pay.						.42				.91					
49. Built or maintained machinery or equipment, for pay.				.48						.96					
50. Operated machinery or equipment, other than standard office machines, for pay.				.42						.95					
51. Designed new buildings or the renovation of old ones, for pay.				.73						.87					
52. Constructed, renovated, or maintained buildings, for pay.				.64						.95					

Table 4 (Continued)

Item (abbreviated)	Questionnaire Factor							Sorting Factor							
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII	VIII
Percentage of total variance	3.4	3.2	3.0	2.6	2.6	2.6	2.4	11.3	9.5	6.4	4.8	4.6	3.4	3.0	1.8

Note. Only factor loadings of ± .30 or greater are shown. The items in the six areas are: academic achievement, 1 to 5; leadership, 6 to 10; practical language, 11 to 22; aesthetic eExpression, 23 to 42; science, 43 to 47; and mechanical, 48 to 52. The items in the Aesthetic Expression quality scores are: Very Important, 23, 24, 25, 27, 29, 30, 32, 36, 37 and 40; Less Important, 26, 28, 31, 33, 34, 35, 38, 39, 41, and 42; Very Rare, 24, 25, 30, 31, 32, 35, 36, 37, 39, 41, and 42; and Less Rare, 23, 26, 27, 28, 29, 33, 34, 38, and 40.